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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination December 2024 (2019 Scheme)

Course Code: EET306

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1		Explain the working principle of wide band gap devices	(3)
2		Explain the necessity of isolation in gate drive circuits	(3)
3		Draw the input and output voltage waveforms of a single phase fully controlled rectifier for a>90 in discontinuous conduction mode feeding to RL Load.	(3)
4		Draw the output voltage waveform of a 3-phase controlled half wave rectifier for $\alpha=150^{o}$.	(3)
5		Derive the expression for output voltage and input power factor of a single phase full wave AC voltage controller with R load	(3)
6		Explain the working of current source inverter with a relevant diagrams	(3)
7		With a neat circuit diagram and waveforms explain the working of a buck converter	(3)
8		Describe the pulse width modulation control in dc-dc converter.	(3)
9		What are the various classifications of load torque.	(3)
10		With the help of a neat block diagram discuss the various parts of an electric drive.	(3)

PART B

Answer one full question from each module, each carries 14 marks.

Module I

11	a)	With a neat circuit diagram and relevant waveforms describe briefly how firing angle control up to 180 degrees is obtained in a RC triggering circuit for SCR.	(7)
	b)	Explain the structure and principle of operation of a power MOSFET	(7)

OR

12	a)	Describe the static and switching characteristics of a SCR.	(10)

b) Deduce the Two Transistor Model for a Thyristor and briefly describe the thyristor operation. (4)

Module II

13 a) Draw the circuit for three phase semiconverter feeding RLE load. Explain the working with suitable output voltage waveforms for a firing angle of 60°,120° and 150°. (10)

b) A full wave converter feeds power to RLE load with R=6Ω and L=6mH and E=60V.The ac source voltage is 230 V,50 Hz. For continuous conduction, find the average load current for a firing angle of 50°. (4)

OR

14 a) Using suitable waveforms describe the working of a single phase full wave converter feeding to RL load for $\alpha>90°$ and $\alpha<90°$.Discuss about the power flow in each case. (10)

b) With the help of neat waveforms derive the expression for RMS output voltage of a single-phase asymmetrical semi converter. (4)

Module III

15 a) Illustrate the operation of a 3-phase bridge inverter operating in 120° conduction mode with output line voltage and phase voltage waveforms (10)

b) Give a comparison between VSI and CSI. (4)

OR

16 a) Illustrate the unipolar and bipolar sinusoidal pulse width modulation control in a single phase inverter. (10)

b) Obtain an expression for THD in output voltage of a single phase full wave inverter with RL load using suitable waveforms (4)

Module IV

17 a) In a step down chopper the dc input voltage is of 100V. The switching frequency of MOSFET 2kH . Find the duty cycle and average dc output voltage if the turn on period of switch is 0.2ms (7)

b) Explain current limit control in dc-dc converters (7)

OR

18 a) Explain the two-quadrant operation of a dc -dc converter (7)

b) Obtain an expression for output dc voltage in terms of input voltage and duty cycle for a buck converter with the help of necessary waveforms (7)

Module V

19 a) Explain the speed control of three phase induction motor using V/f control (7)

b) Explain the simultaneous operation of a three phase dual converter. (7)

OR

20 a) Using suitable waveforms, describe the four quadrant operation of an ideal dual converter (7)

b) Derive the expression for output voltage of a single phase fully controlled converter drive using suitable waveforms (7)

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